

WHAT IS CLAIMED IS:

1     1.   An air discharge valve for discharging air under an  
2       interior pressure ( $P_i$ ) from the interior of an aircraft  
3       body (14) to the exterior atmosphere having an exterior  
4       pressure ( $P_a$ ), said aircraft body having a configuration  
5       defining a flight direction (FD), said air discharge valve  
6       comprising a first valve flap (1) having a first  
7       wedge-shaped sectional configuration with a first leading  
8       edge (8) facing in said flight direction (FD) and a first  
9       trailing edge (8A) facing opposite said flight direction,  
10      a first journal (2) journalling said first valve flap (1)  
11      to said aircraft body (14) at a point closer to said first  
12      trailing edge (8A) than to said first leading edge (8), a  
13      second valve flap (3) having a second wedge-shaped  
14      sectional configuration with a second leading edge (9)  
15      facing in said flight direction (FD) and a second trailing  
16      edge (3A) facing opposite said flight direction, a second  
17      journal (4) journalling said second valve flap (3) to said  
18      aircraft body (14) at a point closer to said second leading  
19      edge (9) than to said second trailing edge (9A), at least  
20      said first leading edge (8) having a curved sectional  
21      configuration, said first journal (2) and said second  
22      journal (4) being spaced from each other in said flight  
23      direction to provide an overlap area between said first and  
24      second valve flaps (1, 3), a nozzle neck (S) formed between  
25      a first facing surface (11) of said first valve flap (1)  
26      and a second facing surface (15) of said second valve flap

(3), said facing surfaces (11, 15) facing each other at least partially, a nozzle inlet (6) converging toward said nozzle neck (S), a nozzle exit (7) diverging away from said nozzle neck (S) along said overlap area, said converging nozzle inlet (6) and said diverging nozzle exit (7) together forming a nozzle length in an air flow direction (AFD).

2. The air discharge valve of claim 1, wherein said first and second wedge-shaped configurations of said first and second valve flaps (1, 3) are so positioned by said first and second journals (2, 4) that said nozzle neck (S) is maintained open when a ratio of said external pressure ( $P_a$ ) to said internal pressure ( $P_i$ ) ( $P_a/P_i$ ) is smaller than or equal to a critical pressure ratio  $(P_a/P_i)_{crit}$  of said internal and external pressures thus  $(P_a/P_i \leq (P_a/P_i)_{crit}$ .

3. The air discharge valve of claim 2, wherein said critical pressure ratio  $(P_a/P_i)_{crit}$  is 0.527 for accelerating air in said nozzle inlet (6) at least to a sonic speed, preferably a supersonic speed when  $P_i > P_a$ .

4. The air discharge valve of claim 1, wherein said first journal (2) and said second journal (4) are so positioned relative to each other, that a cross-sectional flow area of said nozzle neck (S) is enlarged by rotation of at least one valve flap of said first and second valve flaps about the respective journal (2, 3) away from the other valve

flap, wherein said cross-sectional flow area is reduced by rotation of at least one valve flap of said first and second valve flaps about the respective journal (2, 3) toward the other valve flap, and wherein said nozzle neck is closed by said first and second valve flaps contacting each other.

5. The air discharge valve of claim 1, wherein said nozzle neck (S) is positioned where said first facing surface (11) of said first valve flap (1) merges into said curved sectional configuration of said first leading edge (8) of said first valve flap (1).

6. The air discharge valve of claim 1, wherein said first and second facing surfaces (11, 15) of said first and second valve flaps (1, 3) are flat and plane to form said nozzle inlet (6), said nozzle outlet (7) and said nozzle neck (S).

7. The air discharge valve of claim 1, wherein said first and second facing surfaces (11', 15') of said first and second valve flaps (1, 3) are concavely curved to form said nozzle inlet (6) and said nozzle outlet (7) except said nozzle neck (S).

8. The air discharge valve of claim 1, wherein said first valve flap (1) and said second valve flap (3) have surface portions (11B, 16) facing outwardly relative to said aircraft body, said outwardly facing surface portions (11B,

16) each having an aerodynamic surface merging into an outer surface configuration of said aircraft body.

9. The air discharge valve of claim 1, wherein said curved sectional configuration of said first leading edge (8) of said first valve flap (1) has a semicircular curvature.

10. The air discharge valve of claim 1, wherein said nozzle inlet (6) is formed by said curved sectional configuration of said first leading edge (8) of said first valve flap (1) and by a portion (15B) of said second facing surface (15) of said second valve flap (2).

11. The air discharge valve of claim 1, wherein said first valve flap (1) is an inner valve flap relative to said aircraft body (14) and wherein said second valve flap (2) is an outer valve flap relative to said aircraft body (14), said first facing surface (11) having a first surface portion (11A) along said overlap area and a second surface portion (11B) facing outwardly outside said overlap area, said second surface portion (11B) forming a flow guide for air (51) flowing out of said nozzle exit (7), said second facing surface (15) having a first surface portion (15A) along said overlap area and a second surface portion (15B) facing inwardly outside said overlap area, said second surface portion (15B) forming a flow guide for internal air (5) flowing into said nozzle inlet (6).

1     **12.** The air discharge valve of claim 1, wherein said first and  
2         second wedge-shaped sectional configurations of said first  
3         and second valve flaps (1, 2) are formed by a prism (12),  
4         and wherein one lateral prism surface (12A) of at least  
5         said first valve flap (1) facing in said flight direction  
6         comprises a rounded leading edge (8) to form said curved  
7         sectional configuration of said first leading edge (8).

1     **13.** The air discharge valve of claim 11, wherein said first  
2         surface portion (15A) of said second facing surface (15)  
3         and said second surface portion (15B) of said second facing  
4         surface (15) form together an uninterrupted flat and plane  
5         air guide surface upstream of said nozzle inlet (6), along  
6         the nozzle inlet (6), at said nozzle neck (S) and  
7         downstream of said nozzle neck (S) along said nozzle exit  
8         (7).

1     **14.** The air discharge valve of claim 13, wherein said curved  
2         sectional configuration of said first leading edge (8) is  
3         displaced downstream relative to said second leading edge  
4         (9) thereby forming a lead-in funnel with said second  
5         facing surface (15) into said nozzle inlet (6).

1     **15.** An air discharge valve for discharging air under an  
2         interior pressure ( $P_i$ ) from the interior of an aircraft  
3         body (14) to the exterior atmosphere having an exterior  
4         pressure ( $P_a$ ), said aircraft body (14) having a  
5         configuration defining a flight direction (FD), said air

6 discharge valve comprising a first valve flap (1) having a  
7 first wedge-shaped sectional configuration with a first  
8 leading edge (8) having a curved sectional configuration  
9 facing in said flight direction, a first trailing edge (8A)  
10 facing opposite said flight direction, a first journal (2)  
11 journalling said first valve flap (1) to said aircraft body  
12 (14) at a point closer to said first trailing edge (8A)  
13 than to said first leading edge (8), a second valve flap  
14 (3) having a second wedge shaped sectional configuration  
15 with a second leading edge (9) having a curved sectional  
16 configuration facing in said flight direction, a second  
17 trailing edge (9A) facing opposite said flight direction,  
18 and a second journal (4) journalling said second valve flap  
19 (3) to said aircraft body (14) at a point closer to said  
20 second leading edge (9) than to said second trailing edge  
21 (9A), said first journal (2) and said second journal (4)  
22 being spaced from each other in said flight direction to  
23 provide an overlap area between said first and second valve  
24 flaps (1, 3), a nozzle neck (S) formed between a first  
25 facing surface (11) and a second facing surface (15) of  
26 said first and second valve flaps (2, 3), said first facing  
27 surface (11) and said second facing surface (15) facing  
28 each other, a nozzle inlet (6) converging toward said  
29 nozzle neck (S), said overlap area forming a nozzle exit  
30 (7) diverging away from said nozzle neck (S), said  
31 converging nozzle inlet (6) and said diverging nozzle exit  
32 (7) forming together a nozzle length in an air flow  
33 direction sufficient for preventing flow separation from

34 surfaces of said first and second valve flaps (1, 3), for  
35 avoiding vortex formations and for reducing noise  
36 generation.